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JOURNAL

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OF THE

MASSACHUSETTS ASSOCIATION

OF

BOARDS OF HEALTH

An Official Quarterly Record of Information for the Public

JUNE, 1897

Proceedings of the April Quarterly Meeting

Subjects: The Disposal of Garbage — The Production of Formic Aldehyde.

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VOLUME VII NUMBER 2

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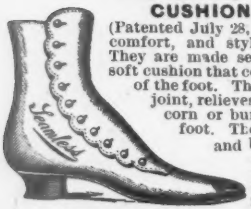

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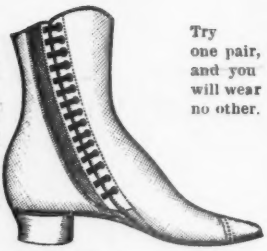

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5. Amylic "		5. Amyl Acetate.	
6. Aldehyde (a chloroform).	Very virulent and deadly poison.	6. Tannic Acid traces.	Harmless.
7. Methane gas (marsh gas).		7. Ext. matter.	
8. Carbon dioxide.			
9. Tannic Acid traces.	Harmless.		
10. Ext. matter.			

JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

April Quarterly Meeting, 1897

SUBJECTS: The Disposal of Garbage — The Production of Formic Aldehyde

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THE JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston in March, 1890, with the following objects: the advancement of sanitary science in the Commonwealth of Massachusetts; the promotion of better organization and co-operation in the local Boards of Health; the uniform enforcement of sanitary laws and regulations; and the establishment of pleasant social relations among the members of the Association.

All persons holding appointments as members of a Board of Health in a Massachusetts city or town, the executive officers of such a local board, and the members of the State Board of Health are eligible to membership. Other persons may be elected members by vote of the Association. The annual dues are one dollar and fifty cents.

The Association holds four regular meetings each year, the annual or January meeting always being held in Boston.

THE OFFICIAL JOURNAL OF THE ASSOCIATION is a quarterly publication, containing the papers read at the meetings, together with verbatim reports of the discussions following them. No part of this matter is printed in any other periodical.

The JOURNAL will present, from quarter to quarter, a fair and adequate picture of the progress of practical sanitary science as applied to the needs of a modern community. The various subjects which are reviewed in the quarterly meetings of the Association are treated by experts qualified to speak from daily experience in Public Health offices, who, as men of science, are careful to be scientific and comprehensive, and who, as public officers, are no less careful to speak pertinently and so as to be easily intelligible to the layman.

The JOURNAL, in a word, appeals to all whose interests touch the questions of sanitation and hygiene,— to the architect, the school-committee-man, the manufacturer, the contractor, and, above all, to the busy practitioner who has no time for any reading but what is brief and to the point.

The subscription price of the JOURNAL is one dollar a year, payable in advance. Single numbers, twenty-five cents. It is on sale at the Old Corner Bookstore, and at Smith & McCance's Bookstore, 57 Bromfield Street, Boston.

All communications to the Association should be addressed to the Secretary, **EDWIN FARNHAM, M.D., City Hall, Cambridge, Mass.**

Subscriptions and all business communications should be sent directly to the publishers,

MAYNARD & SMALL,
6 Beacon Street, Boston.

JOURNAL OF THE

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

ORGANIZED 1890.

[The Association as a body is not responsible for statements or opinions of any of its members.]

VOL. VII. June, 1897. No. 2

APRIL QUARTERLY MEETING

OF THE

Massachusetts Association of Boards of Health.

The April quarterly meeting of the Massachusetts Association of Boards of Health was held in Fall River at the Quequechan Club on the afternoon of Tuesday, April 27, the Vice-President of the Association (Dr. S. H. Durgin) in the chair. Dinner was served from 1.30 to 2.30 P.M., after which the Chairman introduced Mayor Greene, of Fall River, as follows: —

Gentlemen, if you will please come to order, as the hour is now getting late, while the coffee and cigars are being handed to you, I shall take great pleasure in introducing to you his Honor, Mayor Greene, of Fall River.

MAYOR GREENE, OF FALL RIVER.

Mr. Chairman, Gentlemen of the Massachusetts Association of Boards of Health, and your Guests,— I am certainly very glad to see such a large number gathered here to-day. I only regret that the

days are not longer, as I frequently do when I am about my business, and that we cannot double them up a little so as to accomplish a little more work.

I am glad to see so many of you here, but should have enjoyed it very much myself to have given you an opportunity to look about the city a little more; for we are down at the border of the State where a great many people hesitate a long time before they come. They frequently say to me, "Well, I have been through Fall River, but I never stopped there"; and any one passing through by rail gets a very slight impression of it, and we should like very much to give you a good impression of Fall River. But I am very glad to extend to you a hearty welcome to our borders, and to say to you that we are deeply interested in the work in which you are engaged. Perhaps we do not show that wholly by our works. Undoubtedly, our Board of Health would say that we do not treat them as liberally as they would like to be treated; but there is no department of municipal administration, I find by my experience, who think they are well treated. They all think we keep them a little short of supplies. In a city like Fall River we cannot avoid that. We are endeavoring to accomplish a great deal with a very little substance to accomplish it with. Our city has grown so rapidly and we find its needs so great that some things have to be slighted.

I realize that one of the things that ought not to be slighted is this great question of the matter of health as relating to the work in which you are engaged. This winter, before I wrote my inaugural address, I took quite deeply into consideration the matter of the disposal of garbage in our city, and thought that I had a plan evolved by which we might dispose of our garbage, and land it over on our sister city, which has got a little in advance of us in establishing a plant to dispose of garbage. We thought, as they had built a plant in anticipation of great growth and had not got where they could use the whole of it, we might assist them in using the plant. The plant being some twelve or thirteen miles away, we thought we could dump the garbage there. We have found that impossible; and, as a consequence, we have not yet evolved a satisfactory plan for the disposal of our garbage. We have had a petition from our Fall River physicians, I think from the Fall River Medical Society,

asking us to consider this very important question. I think we shall be very glad to do that, and we hope something may be done by which we shall be enabled to carry out our original intention.

The gentleman who will speak to you to-day, as I am informed, on this important subject, is the one who has established this plant near the city of New Bedford; and I trust that he will so lay out the work here that we shall become deeply interested, and possibly be able to accomplish all that is desired.

We have on our hands many important questions and subjects which engage the entire attention of our different departments. We have, in Fall River, done considerable in the line of sewers. I may say that since our incorporation as a city we have spent over a million and a half in the construction of sewers, and have never made an assessment upon the abutters or users of those sewers toward the cost of construction or maintenance of them. I think that is rather an anomalous position, not enjoyed by any other city in the Commonwealth. But, lest any one should say, "Well, I don't see how you do it," I will say to you that I happened to occupy the position of mayor seventeen years ago; and, when I read my inaugural address this year, I made comparison of the city of Fall River of to-day with the city of Fall River seventeen years ago, and I found that, notwithstanding the fact that we had spent so large a sum in the construction of sewers, our increase of indebtedness — I refer to the entire debt, water, sewers, etc.— had been but 9 per cent., while our increase of valuation had been 87½ per cent., and our increase of population over 100 per cent. We are, however, suffering under what occurred before the last seventeen years. We had a large increase of debt previous to the last seventeen years, when we had a great growth, so that we are suffering under that; and that makes us a little short of cash to carry out our desires.

We are to-day struggling with the problem of how we can best extend our sewer system; and, if it is possible, I think the government will take up the question this year, and decide that they will provide some means of income from the vast amount that we have already expended in our sewers.

I went to the legislature this year for authority to hire one hundred thousand dollars outside of the city debt, for the purpose of

extending the outlet of our sewers into the bay below. We have the sewers now down to the shore; but we find there is liable to be trouble from their outlets, and we wish to extend them. We asked for authority to hire that amount outside the debt limit; and it was granted with a stipulation that we adopt some plan of sewer assessment, sewer rentals, or sewer betterments, before the first day of September, or our loan would become inoperative. I have been somewhat criticised because I allowed that amendment to be added to the bill, but I am willing to stand the criticism. I believe it is all right; and I realize, what the city of Boston has already realized, that it is impossible to carry on this vast expenditure for sewers without making some provision for a return from it. I think other cities have found that out by experience. I am informed that the city of Boston has authority from the legislature to assess the entire cost of their sewerage system, which is not generally provided by law for cities. The city of Boston usually gets a little extra legislation. I understand that they have asked for and been granted the necessary legislation, their reason for doing so being that they had gone to their limit, and were obliged to find some other means of obtaining what they desired.

Now we are at our debt limit by reason of great growth, and we have to provide a way to take care of what are the actual necessities of the city. It does not make any difference whether we take care of them by the assessment on sewers or in some other way, only in this respect,—that we are limited by the law to the amount we can raise by taxation, and, therefore, if we are going to do anything more, we must either go to the legislature and ask for authority to go beyond the debt limit each year, and from year to year, or provide some means to obtain some income from the money we have expended.

I think that all the people will concur with me in regard to it,—not only the people of this city, but all the people will concur in the idea that the most feasible method is to establish a plan of sewer assessments or sewer rentals.

I bring this subject here before your attention, in order that you may, if an opportunity offers, speak somewhat upon this line of thought. I also do so because there are here present quite a number of physicians of our city who, I know, are deeply interested in

the problem of caring for the health of our people. They have all the business they want to attend to; and anything that will improve the condition of the people who are here with us, and are to live with us and to make up this community, anything that will improve their condition, I have always found that the members of the Fall River Medical Society always give their hearty support to, and I speak to-day in order that they may take strong and deep interest in the subject which is now agitating the minds of the city council, and must continue to agitate their minds. Whether adopted this year makes no material difference, only "it has got to come," as they say in the city of Boston; and every other city will find that they have got to take it and handle it, and they may just as well take it in hand in 1897 as postpone it until 1898, 1899, or 1900, as the case may be. It has got to be handled; and, although a disagreeable subject to some, it is something that has to be taken care of, and therefore I have called your attention to it.

I realize that the time is getting late, and do not wish to occupy too much of your attention. I am certainly glad to see so many of you here, and to see the deep interest that you have in the work of this Association. I trust that this visit that you have made to Fall River will give you a good impression of the city, and that you will not regret the time and trouble you have taken to come among us, and that you will be so well impressed with the city that you will come again. This will be your first visit, but we trust will not be your last. We stand to-day the third city in the Commonwealth, but a step toward the second place. We are aspirants, of course, for the first; but we do not expect to attain that. However, it is always well to aim high; and we are not going to go back. We never have looked back since we started to plough. We are going to look ahead. I am glad to see so many of you present, and to have had the opportunity of saying these few words to you.

THE CHAIRMAN.— I think we may all sympathize and agree with Mayor Greene in his efforts to obtain sewer assessments in building the sewers of the city. I can speak only for Boston, in saying that up to even a few years ago we assessed upon the abutters three-quarters of the expense; but now we are allowed to assess the entire expense up to the extent of $4 per running foot.

We will dispense with the reading of the principal part of the last records, inasmuch as the hour is late, and ask for that portion of the record which the Secretary finds it necessary to read.

EDWIN FARNHAM, M.D., Secretary of the Association, read a resolution proposing a reduction in the annual dues, as the funds of the Association warrant such a reduction.

THE CHAIRMAN.— The resolution, gentlemen, is before you. The proposition is that, inasmuch as there are funds enough to warrant a reduction in the annual dues, the dues be reduced from $2 to $1.50 per year. What is your pleasure?

The resolution was seconded, and carried unanimously.

THE CHAIRMAN.— The following names have been suggested for membership in the Association, and have received the indorsement of the Executive Committee: —

EDGAR H. GAMMONS	New Bedford.
W. S. KIRSCHBAUM	New Bedford.
HENRY H. WILCOX	Taunton.
N. B. ALDRICH, M.D.	Fall River.
ARTHUR J. CONNELL, M.D.	Fall River.
W. G. BROWN, M.D.	Plymouth.
WILLIAM W. SCOTT	Hyde Park.
CHESTER L. LINCOLN	Fitchburg.

The gentlemen named were declared duly elected. The chairman then read a telegram received from the chairman of the committee "on rules of protection of milk supplies from pollution, and for the investigation of cases and epidemics of disease supposed to result from such pollution," as follows: —

Detained. Please report good progress for our milk investigation. Shall have important and novel results to report later. WILLIAM T. SEDGWICK.

THE DISPOSAL OF GARBAGE.

BY MR. WALTER S. PIERCE, NEW YORK.

Mr. Chairman and Gentlemen,— Among the many evidences of the advancement in civilization in the present age is the wonderful skill exercised successfully in preventing the spread of contagious diseases.

It seems evident now that tuberculosis can be communicated by the dust formed of the dried expectorations of persons affected with that fatal disease, hence the notices in the cars and ferry-boats of New York City forbidding persons from expectorating on the floors of public conveyances under a penalty of a fine therefor.

Investigations have proven that garbage may become a fruitful source of disease. By garbage is meant the animal and vegetable refuse taken from our tables.

Now the theme upon which I have been invited to address this honorable body to-day is the sanitary disposal of this material, which, though harmless when fresh, may become very offensive and dangerous to public health if not promptly disposed of in a sanitary way. It is a subject that is now receiving anxious consideration by the city authorities over our entire country.

For the past few years it has devolved upon me to give this matter a great deal of thought, and to spend much valuable time and no small sum of money to ascertain the best method for disposing of garbage in an absolutely sanitary way and with as much economy as possible.

To this end I have given the various methods for accomplishing this purpose most careful investigation, and shall endeavor briefly to give you the merits and demerits of each.

FEEDING GARBAGE TO STOCK.

The indiscriminate use of this material as food for live stock has never been continued at but few places for any length of time, for the reason that it has proved to be a fertile cause of disease among

the animals, and finally a financial loss to those who have undertaken it. A party who had the contract for disposing of the dead animals of New York City thought he saw a fortune in taking the garbage from the hotels and restaurants and fattening hogs with it. All seemingly went well for a while; but soon disease developed in his herd, and his two thousand hogs died in a remarkably short time. He experimented for a while longer, but finally gave it up; and to-day he will tell you that, if you desire to kill off your cattle and hogs, a most effectual method is to feed them upon garbage as it is collected in cities. Now there is no doubt in my mind that, if the bread and vegetable matter could be selected out while the garbage is fresh, and fed to animals, they would thrive and keep healthy. The trouble is that garbage is not collected frequently enough to have it reach the animals before it has soured and putrefaction has begun.

BURYING GARBAGE.

The method of ploughing in or burying garbage is a better system, but it must be done promptly and thoroughly; and even then, to keep the land from souring, it must be sown in millet or some heavy feeder to keep it sweet, and prevent it becoming offensive. The objection to this method is that it is too expensive, involving in most cities a long haul and a large investment to obtain land for the purpose, and the endless expense of burying it.

CREMATION.

This system, or method, has little to commend it, being expensive and seldom, if ever, free from offence. It has been thoroughly tested, and has few, if any, advocates at the present day. A committee of gentlemen was sent out at considerable expense by one of the mayors of New York City to investigate the various methods for disposing of garbage. They reported as follows upon crematories, or incinerators: "The claim that any one of them destroys all combustible matter was abundantly disproved, and an interesting fact revealed during one test made in the presence of your commission. The refuse was run into an incinerator, and for more than

two hours subjected to a heat of not less than 2,500 degrees, the refuse being violently stirred for most of the time by means of a pneumatic poker. Crude petroleum and compressed air produced the flame, which was of intense fury. And yet, when the residue was examined, there was found, with other combustible matter, pieces of newspaper which were scarcely charred."

"The same may be said of the failure of these incinerators to destroy the noxious gases."

The committee who made this report had the services of a scientific expert in all their investigations, and cremation was condemned by them.

UTILIZATION OR REDUCTION.

There are several processes or methods for the utilization or reduction of garbage, that is, which extract the grease and make the solid residue into tankage, which is one of the best known bases for a most excellent fertilizer average city garbage contains.

	Per cent.
Water, about	70
Grease, about	4
Tankage, about	26

There is a good market for the grease and tankage. They are both useful and valuable. Now to obtain these products in a marketable condition, and to make the process sanitary and inoffensive, has been the aim of every person engaged in the business. These results are claimed by the advocates of those who use the naphtha process, also those who use steam for the extraction of the grease.

There is no doubt whatever but that garbage can be disposed of economically and in an absolutely sanitary and inoffensive manner by a naphtha process, if the business is managed with as much care and skill as any successful factory; and my candid opinion is that the naphtha process is far preferable to the steam process.

It is a well-known fact that there is no agent which so completely destroys the germs of disease and all animal and vegetable life as heated naphtha; and the fact is indisputable that garbage which has been subjected to this treatment is absolutely disinfected and rendered entirely inoffensive.

It is claimed that steam is effectively used for the same purpose, and this may or may not be true; but it would be difficult to find a scientific man who had given the matter careful consideration, who would not pronounce heated naphtha far more effective than steam. They will tell you that one method is positive in its results, while the other is doubtful.

However, both systems have their advocates. St. Louis, Cincinnati, Buffalo, and New Orleans have adopted naphtha processes; and the plants in those cities have been in operation for several years.

Recently a plant has been started in Philadelphia, one in Bridgeport, Ct., and one on Barren Island, about twelve miles from the city of New York, in which the steam process is used.

The one in Bridgeport seemed to have been inoffensive, but was a failure financially for the reason that only a small portion of the grease was obtained, and there was an unusual loss of the solid matter in the operation.

Those at Philadelphia and Barren Island have not been in operation long enough to judge of their merits.

To dispose of garbage in an absolutely sanitary and inoffensive manner requires the co-operation of the board of health and contractor. The former should do all in their power to procure a separation of the rubbish and ashes from the garbage, and require the householders to keep their garbage pails or cans clean. Upon the other hand, the contractor should collect the garbage in neat, clean barrels, which have a metal cover fitting over the top of the barrel snugly, and as soon as the barrel is filled the cover should be placed upon it, and kept on till it is dumped into the extractor at the works.

It is absolutely necessary that each household should have two receptacles, one in which only the animal and vegetable matter is placed; and in the other one should be placed all the rubbish, such as tin cans, berry boxes, pieces of crockery and glassware, bottles, paper, rags, etc. If these precautions are taken, the contractor is enabled to do his work better and cheaper. It is the mixing with the garbage the rubbish referred to that makes the plant or works expensive to construct and to run.

Collecting the garbage in barrels is unquestionably the best method that has so far been devised; and it is very doubtful as to

whether it can be improved upon, being far ahead of the open metal carts now in use in New York and other large cities, which are frequently seen in the streets with the tarpaulins, or covers, thrown back and a pile of sour-smelling and unsightly garbage exposed to view.

The works or plant in which the garbage is to be disposed of should be a fire-proof building, so that no break in the work can occur; for, should a plant be destroyed by fire, the contractor might find it a difficult, if not impossible, problem to dispose of the garbage in a sanitary way till his plant could be rebuilt, and thus the health of a city be seriously endangered.

The plant should be provided with steam or vapor tight steel tanks on extractors, about ten feet high and six to seven feet in diameter, with a large door at the top for charging and a similar one at the bottom for discharging; also suitable steel tanks for storing the naphtha and holding the grease; also convenient driers for drying the tankage, and proper receptacles for the chemical treatment of the waste water so as to render it harmless, or for evaporating and condensing it.

Now, then, when a load of garbage arrives at the plant, the barrels should be hoisted over the extractors, the covers removed, and the contents at once emptied into the extractor. Each barrel should be immediately sprayed with a disinfectant and deodorizer, so as to be in a clean condition to be used again. As soon as the extractor has received its charge, or load, of five to six tons, the doors should be tightly closed and naphtha introduced. The whole mass should then be heated by a coil of steam pipe within the extractor, the heat should be continued for several hours, till the disinfection by the heated naphtha vapor has been thoroughly accomplished.

It will be found that during this operation the grease has been dissolved, and can be drawn into the grease tank, passing out as a solution of naphtha and grease. Then, by heating the grease tank by means of a coil of steam pipes within it, the naphtha will be volatilized, and, passing through the condenser, is ready, in a liquid state, to be used again. In the mean time the grease has been refined and made pure by the naphtha, and is in the best possible condition to find a ready market.

The solid matter left in the extractor will be found to have some naphtha left in it, which must be distilled off in the same manner as from the grease. It is then ready to be dried and disposed of to fertilizer manufacturers as a most excellent base to make a complete fertilizer, or, what is much better, to be converted into a high-grade fertilizer in the garbage works by adding to it the requisite amount of phosphate and potash.

It is self-evident that this high-grade fertilizer can be supplied to the surrounding farming country at a much less price than if the tankage is shipped to a manufacturer at a distance, and by him taken into his works and made into a fertilizer, bagged, and shipped back to the place it came from.

The most modern method or process for using naphtha for the purpose referred to renders the business perfectly safe, so much so that the most conservative fire insurance companies will take a risk on such a plant as has been described at a smaller premium than on the ordinary soap-works. Naphtha is now used in the largest linseed-oil works in the world for the extraction of the oil from linseed. They use barrels of naphtha where gallons are used in garbage works.

In conclusion, allow me to say that we are on the eve of a period when a well-constructed modern garbage plant will be as much a part of every city's outfit as its gas-works, electric-light plant, and water-works, and a revolution brought about in the fertilizing industry. The farmers of New England and our entire country will be supplied with a most excellent fertilizer at a price so low that the products of the farm will be doubled.

A standard fertilizer at a reasonably low price is the great need of the New England farmer to-day; and his only hope for the supply of it is in the establishment of these garbage plants in the cities. The fertilizer manufacturer will tell you that he sees no prospect of obtaining the material composing a fertilizer at a less price than he has been buying them for during the past two or three years. Consequently, present prices for fertilizers are about as low as they can be sold.

It is not an exaggerated statement to say that the establishment of such garbage plants as have been described throughout the cities

of our country will add at least $100,000,000 annually to the income of the farmers; and every one realizes what that means in the way of general prosperity. So that, gentlemen, this waste material which has heretofore been a nuisance and expense to every city, will be converted into a blessing to the country at large.

THE CHAIRMAN.— This paper is open for discussion.

MR. MORSE, OF NEW YORK.

Mr. Chairman and Gentlemen,— I do not intend to delay the order of proceedings. About four years ago I had the honor of making a statement before this Association in the city of Lynn. I was in favor of cremation myself; and the statements then made were to the effect that reduction at that time was in an experimental stage, that it had great promise and great possibilities, and promised to revolutionize the whole system of garbage treatment in this country, and to add to the farmers' interest very greatly.

The statement made on behalf of cremation was that forty or fifty furnaces in the country were burning up this waste. The process of reduction at that time had only five different exponents,— Buffalo, Providence, Philadelphia, St. Louis, and Detroit. Since that time there have been put into use about fifteen different plants for reducing garbage in the following cities: St. Louis, Buffalo, Cincinnati, New Orleans, Bridgeport, New York, Paterson, Boston, St. Paul, Denver, Milwaukee, and, I think, Providence. At present there are five plants only which are operating successfully out of that number,— St. Louis, Cincinnati, Buffalo, New Orleans, Bridgeport.

The following cities have adopted reduction, and have given up or abandoned the work under great difficulties,— Paterson, Washington, Boston, St. Paul, Denver, Milwaukee, New Orleans, Bridgeport, and Providence.

Now that is the record of the reduction process in this country for the last four or five years. In ten years' time, I suppose, I have been the means of burning up more waste in this country, through the furnaces that I have erected, than any other man. I do not

believe in burning up this stuff. I believe we are burning valuable things which we ought to save, but I think to-day that the process of reduction has not proved itself valuable enough to be taken up by cities yet.

There are sixty-five or seventy cities which are using furnaces for cremation; and they get nothing but 5 per cent. of ashes, worth $5 to $10 a ton. In many cases the product of ashes would defray the expense. It is not always true. We cannot show that in every case, but the burning of garbage by furnaces has gone a great deal further than the art of reducing it and making it a product.

If any reduction works can be brought into use which will show a profit on its own work, independent of the bonus to be paid by the city, then the work is accomplished; but, if, on the other hand, any process seeks to be adopted which must have a bonus from the city of from 15 to 50 cents a ton, then there is a loss.

The statement of Mr. Pierce is undoubtedly true that there is great value in this thing, but the figures produced and shown by every company that has come before the public so far do not show that profit. It has not been proven. The figures reported by Colonel Waring in New York show nominally about $2.40 for every ton of waste; but, in figuring on the actual work and getting money out of it, he fails and breaks down.

Now, speaking from my own experience, as Mr. Pierce has spoken from his, I believe, as he does, that the ideal method for any city in this country to adopt will be this,— to utilize the garbage as far as it can be done. But we must remember that the garbage is only 15 to 18 per cent. of the whole waste. What shall be done with the rest?

If you take the ordinary cart-collecting in this town, as I saw this morning, you will find the valuable part, the garbage part, is only 10 per cent. The rest is ashes, rubbish, refuse of all possible matters that will burn and matters that will not burn. That part of the whole cart which must be taken care of is, say, two-thirds of the whole. You can take the 15 or 20 per cent. and do something with it; but what can you do with the other?

In New York we have got to that point where we are taking from six hundred to eight hundred tons of garbage down to Barren Island; but Colonel Waring finds on his hands more than 35 or 40 per cent.

of other waste that he cannot handle, and he is building furnaces to burn it up.

Therefore, I say this: If any suitable process of reduction can be brought forward, be sure to adopt it by all means. Then add to that, means for disposing of the other combustible waste which will have to be burned, and take that combustible waste and turn it into power to reduce your garbage. That is the economical and only way, and the best way that it can be done.

Now the question of handling this matter is getting to be solved on every hand,— the question of carting and transportation, and how it shall be collected and used. A great many men are working at it, and a great many advances have been made. There are many carts in use which are entirely sanitary,— that is, in New York at least,— and many offensive features have disappeared by employing men and means to do the work well. But the great question we must consider, and which every town must look at, is what it is to cost. A reduction plant costing from $15,000 to $25,000 requires a contract of ten years, and must be carried on all that time to show any profit. The city must pay at the beginning not less than 50 cents per ton. Bridgewater was bankrupted, Washington was in a similar case, where they paid more than 50 cents, and the example in Chicago, where they paid 50 cents, was the bankruptcy of the company, also in St. Louis where they paid $1.80.

Now, on the other hand, if a ton of garbage can be reduced to ashes at 50 cents,— and I think it can,— and the ashes turned into money by selling at $8 per ton, the proceeds being applied for the use of coal and labor, this economy comes: the first cost of the plant is only five, six, seven, or eight thousand dollars.

If garbage can be reduced to a merchantable product, and the man who does it can sell the product at $2.40 a ton, and have the city pay him 50 cents for doing the work, he is making great money out of it. Why should not the city have the benefit of it? Is there an example anywhere where that has been done in any case, and successfully carried through?

Four years ago I stated before this Association in Lowell that a furnace was being built to destroy garbage in the city of Lowell. The furnace has been running now four years, and the cost has been:

for the first year, $1.15 per ton; for the second year, $1.10; for the third year, 90 cents; for the fourth year, 72 cents per ton. Last week's run showed a destruction of 83 tons at a cost of 71 cents, and to-day that city has in its hands a proposition from the builders of the furnace to reduce the cost to 40 or 50 cents. Now there is progress. The same furnace which four years ago cost $1.10 or $1.15 per ton will reduce garbage to ashes to-day at 50 cents. Last year showed a net cost on the whole year of 68 cents. Now, if the cost can be brought to 50 cents by experience, certainly it can be brought below that.

Mr. Chairman, I do not desire to occupy the time. I agree entirely with the gentleman who has spoken that, if it can be done successfully, it is the way to do it,— to reduce it; but I say that in all the experience and time spent in this business, and the money, which will run far into a million of dollars, there has not yet been a single example of a successful garbage-reducing plant that makes money for itself, and does it at a very small cost to the city as compared with cremation.

THE CHAIRMAN.— I notice that Mr. Morse says, "If it can be done successfully"; and I apprehend there are many here who would like to know just what the colonel means when he says, "If it can be done successfully," it ought to be done.

MR. MORSE.— I mean by "successfully" this: First of all, within city limits, it is not to cost anything for transportation. Second, there is to be a profit to the man who does the business. The city must be protected against offence, and pay very little indeed for the protection.

THE CHAIRMAN.— Success financially, you mean?

MR. MORSE.— Yes.

THE CHAIRMAN.— Mr. Coffey, of Worcester.

MR. COFFEY, of Worcester.— From the second city of the Commonwealth, Mr. Chairman, with all due respect to the Mayor; and I may say, parenthetically, that that step which he says separates Fall River from Worcester is one which will have to be taken by

some one with seven-league boots. As the Chairman knows, in 1893, at the order of the City Council of Worcester, I investigated this subject of garbage disposal, and saw in operation all the plants that were then in existence. I travelled as far south as Washington, west as far as Chicago, and north to Montreal, and saw all the plants in operation in the various cities of the country at the time, within that radius.

I do not agree with Mr. Pierce in saying that the system of cremation is a failure. On the contrary, I am very firmly of the opinion that for smaller cities the system of cremation is the best.

In the first place the product is of no value to the city, if it costs $1.50 to get a dollar's worth. The agents of these reduction systems claimed that there was 30 to 35 per cent. in the investment. That is what they would whisper in your ear; but they wanted $50,000 to establish the plant, and then the city to pay 50 to 75 cents per ton for reducing it. I confess I was not favorably impressed with it from a sanitary standpoint. The reduction system is too complicated. There is too much machinery to it. I saw a plant in operation in Washington, costing one hundred thousand or more dollars; and it was not a sanitary success, in my opinion. It was subsequently burned down, and the city refused to allow it to be rebuilt. Washington is now, I understand, putting in a system of cremation. I do know furnaces can burn this garbage without serious offence. I do not take into account the value of the ash. That is a claim made by the agents of this system; but, in my opinion, it cannot be taken into serious consideration.

The question that presents itself to the average municipality is that this system of cremation is simple. The cost at the outside to erect a plant is not more than $10,000 or $12,000; and such a plant would be large enough to burn the garbage of a city of 100,000 people, and it can be owned, operated, and managed by the city afterward, while the reduction process is always a stock company, and there is always the suspicion of stock jobbing about it.

Now, as I have said before, it is of no account to the city, if there is a value in this garbage, if it costs more to get it out than you obtain for it when it is gotten out.

We had an offer at that time, from a concern whose furnaces I

saw in operation and which are still in operation, to erect a furnace for the city of Worcester. The cost was to be $10,000, and a guarantee that the cost per ton would not exceed 45 cents. That was four years ago. Since then I have not given any particular attention to the subject; but I am informed, in a general way, that improvements have been made in the furnace, so that the cost to-day is somewhat less per ton than it was at that time. Now I do not agree with Mr. Pierce, either, that the feeding of garbage to swine is a failure. If it was so, we should probably be able to get rid of the hog power that we have in the city of Worcester. It has been in successful operation in Worcester for years, and is a financial success, leaving out the sanitary aspect of the case entirely. They have not had any epidemic among their hogs. The hogs have thriven and multiplied, and there are about 2,000 to-day eating up the garbage of Worcester.

This is my experience. As I have said repeatedly, I believe furnaces for the smaller cities are best, because you can own them outright, control them outright, and the initial cost is not large.

MR. BRIMBLECOM.— I do not know that I can add anything to what has been said, as Mr. Coffey voices my sentiments in the matter. I would only like to refer the Association to the reports made for the last two years to the American Public Health Association by Rudolph Hering, of New York City, in which, on both occasions, he states that the cremation process is the only one he considers worth bringing before the Association. He does not consider the reduction process as at all sanitary. It seems to me that that position is being strengthened right through,— that the reduction process is not a sanitary method, and ought not to be supported by persons engaged in sanitary work. I think those of us who visited the Buffalo works last September were thoroughly disgusted with the appearance of the works and the odor there was about the premises. I have read with interest the report of the New York State Board of Health upon that matter. A petition was brought to them by residents of the suburbs of Buffalo, and they held quite an extensive hearing. The testimony brought before them was very interesting; and the result was that they appointed an inspector, at

the expense of the company, to see that the place was kept in a sanitary condition. That is sufficient comment on the Buffalo system of disposing of garbage.

In my opinion the ideal solution of the garbage problem is to dispose of it upon the premises where it is made. It ought not to be taken away from the premises; but, if, by any combination of circumstances, it is impossible to have it disposed of upon the premises, then the city should burn it in some way. There are various ways of doing this; and the experience across the water, and in one plant here on this side of the Atlantic, shows that it can be done in a sanitary way, and at a cost not exceeding 30 cents per ton.

I trust that the matter can be practically brought to a head by having the members of this Association support a bill, which has been presented to several legislatures, prohibiting the feeding of garbage to swine. That bill, to my own knowledge, has been before the last two legislatures, and in 1896 I was the only person who appeared in favor; and I had to fight the whole city of Worcester, which came down with mayor, aldermen, and overseers of the poor, but I think the board of health was not represented.

At a hearing on the same bill at this legislature, as I had received such an overwhelming defeat in 1896, I kept quiet. I went there for information only, and found the whole city of Worcester there in opposition, as before. Mayor Quincy, of Boston, appeared to be in favor of the bill; but the committee again reported leave to withdraw. If this Association can, in some way, secure the passage of that bill, I think it would be the opening wedge to the sanitary disposition of our garbage.

DR. CHAPIN, of Providence.— I do not know that I can add anything to what has been said this afternoon. It seems to me that Mr. Morse has told us what the situation is. I agree with him that I should like to see a reduction process successful, and I agree with him entirely as to what success means. I have not as yet seen any reduction plant that was successful. I hope that it will come; but, at present, I certainly cannot recommend it. We had the Simmonian system in Providence; and I know, as Mr. Pierce says, that

a ton of garbage is worth $3, but it cost us $5 to get that out, and so the works were abandoned.

THE CHAIRMAN. — There are still left a few minutes in which this paper may be discussed briefly. Does any one wish to say a word more?

MR. PIERCE. — I have a few words of reply to these gentlemen. I seem to be in a minority here to-day, and I must say that I am a little surprised for this reason. If the people of this country have a reputation for anything at all, it is for their enterprise and skill in manufacturing industries.

We have here an article, which one of my friends says is not valuable, and has nothing of value in it; and another says that it is of value, that there is value in it; but that it is obtained at $5 when it is only worth $3 per ton. Now we all know that, if garbage contains $3 worth of products, the people of this country are not going to consider it an impossibility to get those products out economically, and in such a way as that they will pay.

Now, in reply to my friend, Mr. Morse, I would say that he emphasizes the fact that the city of St. Louis paid $1.80 per ton. I expect that the gentlemen who obtained that contract thought, as most gentlemen here would think, that they would get it at as high a price as they possibly could; and I think, by some hocus pocus among the politicians, they were enabled to obtain $1.80 in St. Louis. The company who furnished that process are wealthy people; and they know the value of a dollar, and are not anxious to get contracts on which they will lose money. They succeeded in getting the highest price for treating garbage of any company. But the same company, when it came to bid for a contract in New York, offered to take the garbage for about 75 cents per ton. With all their experience in running an expensive plant at St. Louis, they did not make but $1.80; and they came to New York, and agreed to take a contract there at their offer of 75 cents. Another utilization process company did obtain that contract for about the same price, an equivalent of about 75 cents per ton.

Now, in answer to Mr. Coffey, of Worcester, I would say that I have great respect for his judgment. But here is the report of a

committee sent out from New York City by one of its mayors. That committee or commission consisted of Thomas L. James, who is our postmaster; Charles G. Wilson, president of our Board of Health; Franklin Edson; Daniel Delehanty, lieutenant United States Navy; and W. S. Andrews, commissioner of street cleaning. These gentlemen were not interested in cremation or utilization processes. They visited, at great expense, all the cities of importance in this country. They examined all the processes; and, when they returned, they reported, as I told you, about crematories, condemning them in their recommendation, which, if you will bear with me a few minutes, I will read: —

First. They recommend that dumping city refuse of any nature in the waters of the harbor or its adjacent or tributary waters should be absolutely prohibited.

By the way, they went on to show that it killed the oysters, absolutely, in water at all shallow.

Second. That the ordinance requiring householders to keep separate garbage or kitchen refuse from ashes and other house refuse should be rigidly enforced.

Third. That all house refuse should be collected in galvanized iron vessels with tight-fitted metal covers, and of such sort that, when full, it can be easily handled by one man.

Now, gentlemen, these are business men, having no system to advocate; and this is their report. They are men well known, and had a scientific expert with them, a man of great ability, whom I know well; and they examined this subject carefully.

Fourth. That daily collections of garbage should be made by the city and delivered at the dumping wharves into the temporary storage, or to self-propelling boats of an approved type, furnished by the party having a contract with the city for final disposition of the garbage.

As the plant for the reduction of the garbage of this city would necessarily be extensive and costly, a contract for a sufficient length of time should be offered by the city to warrant the investment, say not less than ten years, with proper provision for the transfer of the property by the contractor, at fair value, when the contract is terminated. Ample provision should also be made, and abundant secu-

rity required for the performance of the work on the part of the contractor in a clean, inoffensive, and sanitary manner, and removal of the garbage daily from the city to the reduction works, which should be located at a suitable point beyond the city limits.

Sixth. That a separate collection should be made of the remainder of the refuse of the city not otherwise provided for, which should be used for filling in at Ryker's Island or elsewhere, and for the transportation of this material a sufficient number of self-propelled boats of an approved type should be constructed and owned by the city.

It should, however, be provided that, whenever the whole or any considerable portion of the street sweepings can be disposed of by contract, or sold for fertilizing purposes at a price greater than their value to the city for filling, then such disposition should undoubtedly be made of them.

Seventh. That the city adopt metal, water-tight covered carts, or trucks, of a uniform pattern, for the collection of all refuse, and mechanical dust-collecting sweepers, when a satisfactory type can be obtained, and that, whenever the sweeping of the streets causes dust to arise, they shall first be sprinkled.

Eighth. That each refuse cart or truck depositing its contents should be disinfected, and washed out thoroughly, before leaving the wharf.

Now the fifth I skipped, simply because I want it to come in last; and I want you, gentlemen, to consider the importance of these recommendations.

So far as I am personally concerned, the garbage business is incidental entirely. I am not dependent upon it in any way, shape, or form. I was led to investigate it from the fact that the business I was engaged in — the importation of a very high grade of phosphate — was greatly improved by reduction processes, provided they were a success.

Fifth. That the garbage should be disposed of by a reduction process producing fertilizer and commercial grease, and that the city should invite competition by the various companies controlling such systems, in order that the greatest benefit to the city may result.

I will briefly say that I do not care a cent about the garbage busi-

ness, and I will tell you that I know, positively, that it will not be three years until every city of any size, that is not tied up by contract, will have the utilization process; and this valuable material will be returned to the farmers, where it belongs, at a price so low that there will be a revolution in the fertilizer business.

EDGAR H. GAMMONS, New Bedford.— Gentlemen, you have honored me by electing me a member of your Association. I came here feeling first-rate, and now I feel better still.

I have just finished a plant costing me about $30,000; that is, myself alone. I went about the country considerably, and examined several plants, and decided that this was the best thing I knew of, could find out, or hear anything about. I have undertaken the construction of this plant. If it is a failure, why, pity me. If it is a success, you will all know it; and I want to give you all a cordial invitation to see it. We expect to be running in about three weeks.

A MEMBER.— I should like to know the form of process.

MR. GAMMONS.— It is the Pierce reduction system. The garbage never sees daylight from the time it is taken at the house until it goes into the extractor. The next time you see it, it is in a dry form, as dry as meal. I carried some in my pocket for a month, and there is nothing offensive about it. I am satisfied that the sanitary end is all right: the financial end I have to find out. I think I shall come out whole. I do not think I am going to get a big thing for nothing; but I think I am going to satisfy the city, and believe there will be a margin on the right side.

MR. PIERCE.— It is not often that I undertake to advise a body of men, that is as intelligent as I know you are, in any matter; but what I have to say to you to-day is this: If you have any idea of contracting out your garbage or making any garbage products, go slow, and, as an old friend of mine used to say, "learn to pedal." The time is at hand when, if you have any system but a reduction system, you will be sorry for it.

THE CHAIRMAN.— There is but a short time left in which we may make remarks concerning the use of formic aldehyde and the instru-

ments by which this gas is produced or generated. Our train, I think, leaves at 5.41; and we must not forget that. I will try not to forget it.

REMARKS, "LAMP AND GENERATOR FOR THE PRODUCTION OF FORMIC ALDEHYDE."

BY DR. S. H. DURGIN.

I have received so many questions from boards of health and institutions in the last few months with regard to formaldehyde gas, but particularly with regard to the instruments by which the gas may be produced, and also requests by members of the Association to bring before you this apparatus, that I have consented to do so, and to make but very brief remarks concerning the effect of the gas itself.

I believe that experiments have long since shown that this agent is one of the most powerful germicides with which we have become acquainted. For all kinds of pathogenic bacteria the agent does its work quickly and economically, and is the first agent, within my knowledge, which can suitably take the place of the sulphur dioxide gas.

I have no doubt that every person here connected with any public service feels as I do,— glad to give up the old sulphur process when we can find a better agent.

I think we may take it for granted that this agent is an effectual germicide. The tests have shown it to our satisfaction. The only question which has been a difficult one to solve is as to the apparatus by which this agent may be made available.

There are various lamps now in the market by which wood alcohol may be dehydrogenized so as to give us formaldehyde gas liberated in the room and upon articles to be disinfected. These lamps are not all upon one line of construction; but a simple one is here before you, manufactured under the direction of Dr. Kinyoun, of Washington, a surgeon of the Marine Hospital Service.

There is another lamp on similar lines constructed under the direction of Professor Robinson, of Maine. The Kinyoun lamp con-

sists of a pan or receiver into which we place mineral wool, and upon that we pour the wood alcohol. The alcohol being ignited, we place this collar down over the lamp, and the flame from the alcohol, passing through the wire screen, immediately comes in contact with this platinized asbestos disk, which, as you see, is perforated with little holes. When this disk has become aglow by the heat, then we take this hood, pass it down over the collar, past the little ventilation holes, to extinguish the flame. Then remove the hood, and you have the lamp in operation.

The operation is by the evaporation of the alcohol up through this platinized disk; and the alcohol, coming in contact with this platinum, is deprived of a certain portion of its hydrogen, and liberates into the atmosphere the formaldehyde gas.

Theoretically, this is all right, and has in some instances worked very well; but it is surrounded with little difficulties. In my own hands, as well as in the hands of a great many others whom I have talked with, it often fails to work more than for a few minutes at a time. There was found to be a leakage of air at the bottom of this collar; and, to correct this, another pan has been added to the bottom, rising two or three inches on the side, and giving opportunity to make a water-seal over the lower edge of this collar. But, with this alteration, I am still unable to make it work well.

Practically, after the lamp is operated five or ten minutes, the process stops, and you find nearly as much alcohol as you poured into the pan. Again, if the little holes in the disk are too large or too small, the process is defeated. Unless every atom of the alcohol comes in contact with this platinum, it passes through as alcohol, and therefore gives you no formaldehyde gas. If these holes are too small, then you get too great an oxidization of your alcohol, and no formaldehyde gas.

I used these lamps in January and February; but, not succeeding with them, I began to use the Autoclave, a specimen of which I have here. In this, instead of taking the wood alcohol, we purchase the formaldehyde gas in a 40 per cent. aqueous solution; and this, mixed in equal parts with a 20 per cent. solution of calcium chloride, is placed in this copper tank, and heated with the spirit lamp underneath. Boiling, the mixture sends off the required gas. The for-

malin boils at 175 degrees Fahrenheit, while the water which is in the mixture boils only at 212 degrees. The gas is liberated by means of an automatic valve, situated at this point, under a pressure of three atmospheres.

With the lamp, when it works, you can liberate the gas from about a litre of alcohol in an hour. That is about the best that can be done, I think; and you may consider yourself fortunate if you do that. With this Autoclave, or regenerator, you use an exact amount of gas which you are sure to liberate into the room. You not only have an exact process, and know precisely what you are going to liberate into the room in a given time, but you liberate it almost twice as fast as by the lamp. You all know how important it is that you should liberate your gas as rapidly as possible on account of the many leaks in the room after you have tightened it up as well as you can.

The lamp costs about $2.50. This (the Autoclave) singly would cost $12, but on large orders may be purchased much cheaper. From the experience I have had since the first of last January, I would much prefer to purchase the Formalin Solution, and liberate the gas with this regenerator; and certainly, when you consider the effect which you are sure to produce with the one, and which you are very likely to fail to produce with the other, this process is the cheaper of the two. The formalin costs about 25 cents a pint; the wood alcohol, about 70 cents a gallon.

If there are any questions concerning the practical use of the lamp or the regenerator, so far as I have been able to gain experience, I shall be glad to answer them: otherwise, I have no further remarks to make at the present time.

I will light this lamp, so that you may see its working. This spirit lamp, for heating the mixture, would require about four ounces of wood alcohol for each two litres of the mixture. I have lighted this one, and in about ten minutes we shall find the gas being liberated here.

I forgot to tell you of an important part of this (the Autoclave), which is that a rubber tube may be used to connect the escape pipe for the gas with the interior of the room which is to be disinfected, and set your apparatus on the outside. By means of this rubber

tube, and a little copper pipe passed through the key-hole and tightened up by means of this rubber cup, you discharge the gas into the room. At the end of about thirty or forty minutes you may take away your apparatus, put a little plug of cotton in the key-hole, and go to the next house for further work.

A MEMBER.— How long do you keep the room closed?

DR. DURGIN.—For surface disinfection, a few minutes under this pressure will be sufficient to kill almost all the pathogenic germs; but, if you want penetration, you will have to keep the room closed, with a plentiful amount of this gas, for about five hours. I think for the disinfection of mattresses, folded blankets, etc., five hours have been found ample. For pillows there is not much evidence that the penetration has been effectual even after five or ten hours; but I do not believe that the centre of a pillow is likely to be infected, if the pillow has been kept intact.

A MEMBER.— What is the name of this apparatus, and where can it be obtained?

DR. DURGIN.— It is constructed by the Sanitary Construction Company of New York. The lamp I show here was constructed for us by Mr. H. I. Gregory, of Washington, D.C.

Dr. Chapin, of Providence, has had considerable experience in the study of formaldehyde gas, and considerable experience in experiments with the same and with the lamps. I will ask Dr. Chapin to inform you as to the results of his experiments.

DR. CHAPIN.— I came down here to see if I could learn how to use formic aldehyde gas in an efficient manner. I shall want to get an Autoclave, and try that, because I have not been entirely successful with Dr. Kinyoun's apparatus. Dr. Schwartz, of the State Board of Health, obtained one, and kindly loaned it to me; and I have been experimenting with that, and a couple more which I constructed, and I have found the same difficulties that Dr. Durgin has found. I have found a difficulty in getting the apparatus to work.

I have, in almost all cases, tested disinfection by exposing rods

infected with diphtheria germs; and, as a matter of fact, they are not disinfected half the time. I lay it to the fact that the machine does not work properly. It does appear to me that the other apparatus promises better, though it is possible, by altering this one somewhat, it can be made to generate the gas efficiently.

I should like to ask one or two questions. In the first place, How much formalin is used for 1,000 cubic feet?

DR. DURGIN.— The quantity, found by experiment so far with this, is something less than a litre of the mixture per thousand cubic feet.

DR. CHAPIN.— I should also like to ask what precautions he (Dr. Durgin) takes about making a room tight. I often find one great difficulty. The gas is so diffusible that in an ordinary room it disappears in a very short time after it has been generated. You may generate the gas so that it is impossible to enter the room, and in a very short time it will go out through the cracks of the doors and of the windows. I should like to know the practical precautions Dr. Durgin takes to keep it in.

DR. DURGIN.— This is the most important question that could have been asked, for everything depends upon the tightening up of the room. Some rooms are quite easily closed up so as to hold the gas fairly well. Other rooms will require a great deal of work and a great deal of patience; and even then you must discharge a large amount of gas very quickly, or else you will lose the gas from the room too soon to do much penetration. We use a good deal of cotton batting crowded into the crevices. We use newspapers for the same purpose. I think one of the best things, however, is the little paper ribbon about 1½ to 2 inches wide, which may be purchased at the stores, pasted up and down the cracks. All fireplaces, of course, must be crowded full of either rags or paper. I think the little paper ribbon pasted on the window casings and the doors is, perhaps, the most effectual thing I know of.

DR. CHAPIN.— Is it your practice to paste up the windows in all cases?

DR. DURGIN.— No, sir, it has not been the universal practice. It is done to some extent. The men get accustomed to closing up these cracks with cotton and paper, and, by experience, they do pretty well; yet, I think, it is not as effectual as the pasting with the paper ribbon.

DR. CHAPIN.— There is one other thing that I should like to mention. Those of you who have had the misfortune to sleep in a room that has been disinfected by sulphur dioxide know how disagreeable that is, and how long it remains. Now the presence of formic aldehyde gas is not much more pleasant; but, fortunately, we can get rid of the formic aldehyde gas by evaporating a little ammonia. It is remarkable how quickly the disagreeable effects of the formic aldehyde gas can be destroyed by ammonia.

A MEMBER, New Bedford.— I will say, Mr. Chairman, that, like Dr. Chapin, I came here to learn, and have been interested in this apparatus. The apparatus we have used is much simpler than that. It is a modified lamp procured in Indianapolis, and from that we can understand the diffusibility of the gas and the simplicity of its working. This seems to be a far more perfect apparatus, and we shall take the earliest opportunity of procuring one of these Autoclaves.

DR. DURGIN.— There is a much larger Autoclave we can use for this purpose, and which we shall be obliged to use in quarantine on large ships, in school-houses, and in other large spaces. Those will cost, probably, $150 apiece, and are manufactured by this same concern.

Those of you who would like to get a clear idea of the character of this gas can pass this way, and do so.

After some further inspection of the apparatus and its working, it was moved and seconded that the meeting adjourn.

Adjourned.

Extract from the Report of the State Board of Health on the use of Antitoxin for the year ending March 31, 1896.*

The whole number of individual reports received by the Board from all sources for the year ending March 31, 1896, was 562. It is impossible to state the exact number treated with the antitoxin furnished by the Board during the time stated. It is probably not far from 1,000.

In order to form a just estimate of the value of this agent from the experiences recorded, it will be necessary to classify the returns, and to separate those where a bacterial diagnosis was made by culture from those where no such examination was made. Of the former there were 289 returns, and of the latter there were 273.

Cases in which a Bacterial Examination was made.— It is desirable to divide this class into two groups,— those in which the diagnosis was positive and those in which it was negative. There were 262 cases in which the diagnosis was positive, as shown by cultures taken from the throat; and of this number 36 died, or 13.7 per cent. of the whole number of positive cases.

Sex.— The number of males was 125; and the deaths of these were 18, or 14.4 per cent. The number of females was 135; and the deaths of these were 17, or 12.6 per cent. The sex of two was not stated.

Ages.— By ages the numbers and the deaths were as follows: —

Age Periods.	Cases.	Deaths.	Fatality (Per Cent.).
From 0 to 2 years,	30	9	30.0
" 2 to 5 "	71	16	22.5
" 5 to 10 "	91	9	9.9
Over 10 years,	67	2	3.0
Age unknown,	3	0	0.0
Totals,	262	36	—
Mean,	—	—	13.7

Day of Illness when Antitoxin was first administered.

Fatality,	1st day,	0.	
"	2d "	9.7	
"	3d "	8.7	
"	4th "	15.4	
Fatality,	5th day,	22.2	
"	6th "	20.0	
"	7th "	33.3	

In many instances the day of administration was not stated. The foregoing table relates only to those cases in which the day of illness was noted on which the antitoxin was used.

The remainder of this report may be found in the Twenty-seventh Annual Report of the Board.

*The Report for the year ending March 31, 1897, is now in press.

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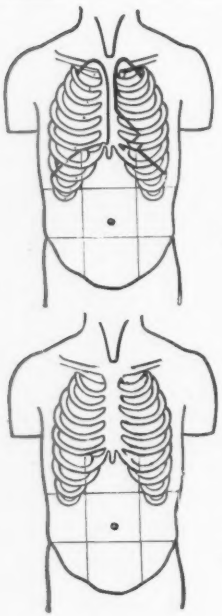

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beg to announce that they have issued an Index of the first six volumes of the Journal of the Massachusetts Association of Boards of Health, compiled by Dr. S. W. Abbott.

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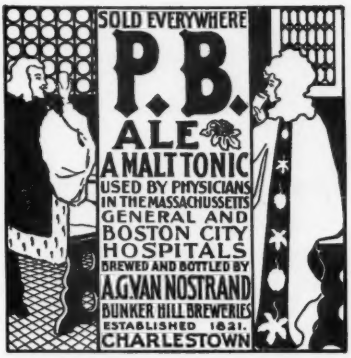

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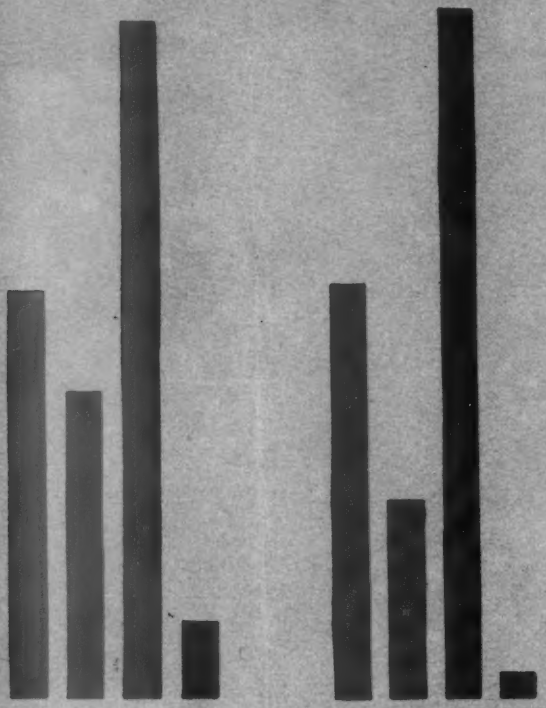

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